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BNSF AT-GRADE RAILROAD CROSSING AT MADISON STREET AND WASHINGTON STREET

QUEUE STUDY ANALYSIS

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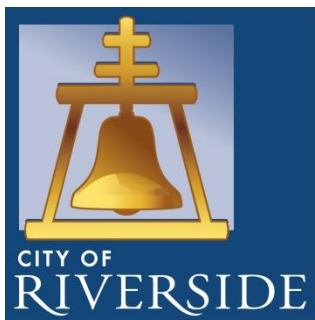


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BNSF At-Grade Railroad Crossing Queue Study

RCTC'S *Grade Separation Priority Update Study for Alameda Corridor East (Riverside County)* prepared on February 2012 provides existing (2011) and future 2035 train figures for the at-grade railroad crossings that includes Madison Street and Washington Street. The study provides:

- Daily Train Volumes – Table 3.1
- Train Volumes by Peak Hour Periods – Table 3.2
- Train Speeds and Train Lengths – Table 3.3
- Vehicle Hours of Delay and Gate Down Time (Minutes) – Table 3.4

In addition, Iteris' *Cristal View Terrace/Green Orchard Place/Overlook Parkway Project* Traffic Impact Study (TIA) analyzed four scenarios that would impact both Madison Street and Washington Street at the BNSF railroad crossings. The City used RCTC's *Grade Separation Priority Update Study for Alameda Corridor East (Riverside County)* and Iteris' TIA to analyze the four scenarios and determine the morning and evening peak hour queues at the railroad crossings for existing and 2035 conditions.

I. Background

The study evaluates the four circulation scenarios as outlined in Iteris' *Cristal View Terrace/Green Orchard Place/Overlook Parkway Project* Traffic Impact Study (TIA):

- Scenario 1: Gates closed at Crystal View Terrace and Green Orchard PI and no connection of Overlook Parkway to the east across the Alessandro Arroyo and to Alessandro Blvd.
- Scenario 2: Gates removed at Crystal View Terrace and Green Orchard PI and no connection of Overlook Parkway across the Alessandro Arroyo or easterly to Alessandro Blvd.
- Scenario 3: Gates removed at Crystal View Terrace and Green Orchard PI and Overlook Parkway would be connected between Via Vista Dr and approximately 500 feet west of Sandtrack Road and Over the Alessandro Arroyo.
- Scenario 4: Gates removed at Crystal View Terrace and Green Orchard PI and Overlook Parkway would be connected between Via Vista Dr and approximately 500 feet west of Sandtrack Road and Over the Alessandro Arroyo. In addition, "C" Street would be constructed to connect the intersection of Overlook Pkwy at Washington St to the intersection of Victoria Ave at Madison St

This study will generate queue lengths for the morning and evening peak hours. The vehicle queue lengths (feet) will be generated for the following conditions:

- Existing freight
- Existing Metrolink
- Existing freight + Metrolink
- Existing freight + freight
- Future Freight
- Future Metrolink
- Future freight + Metrolink
- Future freight + freight
- Future Freight + Overlook Pkwy Extension

- Future Metrolink + Overlook Pkwy Extension
- Future freight + Metrolink + Overlook Pkwy Extension
- Future freight + freight + Overlook Pkwy Extension

The following are required to determine vehicle queue lengths:

- Determine vehicle arrival rate in vehicles per minute
- Determine Gate Down time
- Assume each vehicle occupies 20 feet of roadway storage
- Assume that combinations of freight + Metrolink and freight + freight will occur as there are two active rail lines that can serve multiple trains concurrently

Train Arrivals

Per RCTC'S *Grade Separation Priority Update Study for Alameda Corridor East (Riverside County)* prepared on February 2012 the number of trains through the Madison St railroad crossing is expected to double by Year 2035. As shown on Tables 1 & 2 the number of trains in 2011 are 68 and by 2035 the number is estimated to increase to 137. Table 3 shows average arrival rates during the morning and evening peak hours for existing and 2035.

Table 1 – Existing Train Volume by Time Period at Madison St at BNSR RR Xing

Type	AM Peak	Midday Peak	PM Peak	PM Off Peak	Night	Daily
	6-9 AM	9AM-3PM	3-7 PM	7-10 PM	10PM-6AM	
Total	13	16	13	7	19	68
Freight	7	10	5	5	15	42
Metrolink	5	6	8	1	3	23
Amtrak	1	0	0	1	1	3

Table 2 – 2035 Train Volume by Time Period at Madison St at BNSR RR Xing

Type	AM Peak	Midday Peak	PM Peak	PM Off Peak	Night	Daily
	6-9 AM	9AM-3PM	3-7 PM	7-10 PM	10PM-6AM	
Total	24	31	26	17	39	137
Freight	14	21	12	12	32	91
Metrolink	9	10	13	4	6	42
Amtrak	1	0	1	1	1	4

Table 3– Train Arrival Rates

Year	Type	AM Peak (6-9 am)			PM Peak (3-7 pm)		
		Trains	Arrival Rate Every	Arrival Rate Every	Trains	Arrival Rate Every	Arrival Rate Every
2011	Freight	7	25 Minutes	13.8 Minutes	5	48 Minutes	18.5 Minutes
	Metrolink	5	36 Minutes		8	30 Minutes	
	Amtrak	1	3 Hours		0	NA	
2035	Freight	14	13 Minutes	7.5 Minutes	12	20 Minutes	9.2 Minutes
	Metrolink	9	20 Minutes		13	18 Minutes	
	Amtrak	1	3 Hours		1	4 Hours	

Train Crossing Gate Down Time

Tables 4-6 are provided in RCTC'S *Grade Separation Priority Update Study for Alameda Corridor East (Riverside County)* dated February 2012. The tables provide existing and 2035 train lengths, speeds, and daily gate down times at the BNSF trains crossings within the City of Riverside. By 2035 the "Daily Gate Down Time" will more than double due to the increased number of trains and increased train lengths.

Table 4 – Train Speeds and Lengths through Madison St at BNSR RR Xing

Train Speed (mph)		Train Length (ft)				
Freight	Passenger	Freight		Metrolink		Amtrak
2011/2035	2011/2035	2011	2035	2011	2035	2011/2035
40	55	5,000	6,500	500	750	1,000

Table 5 – Train Time to Traverse Railroad Crossing

Train Type	Speed (mph)	Speed (ft/sec)	Train Length	Total Time (sec)
Freight	40	58.7	5,000	85.18
			**6,500	110.73
Metrolink	55	80.7	500	6.20
			**750	9.29
Amtrak	55	80.7	1,000	12.39

** 2035 Train Lengths as indicated in RCTC's study

Table 6 – Daily Gate Down Time Analysis

Year	Train Type	Daily Trains	Train Length	Gate-Down Time Per Train (s)	Track Time Per Train (s)	Daily Gate Down Time (min)
2011	Freight	42	5,000 ft	37.7	85.18	105.35
	Metrolink	23	500 ft	37.7	6.20	
	Amtrak	3	1,000 ft	37.7	12.39	
2035	Freight	91	6,500 ft	37.7	110.73	261.45
	Metrolink	42	750 ft	37.7	9.29	
	Amtrak	4	1,000 ft	37.7	12.39	

II. Madison Street Queue Analysis

Madison Street is a north-south street which runs between Arlington Avenue and Dufferin Avenue. Madison Street at BNSF Crossing is a two lane roadway and is approximately 600 feet to the southerly limit line at Indiana Avenue. South of the railroad tracks Madison St is a two lane roadway with a striped two-way left-turn lane. North of the railroad tracks, Madison Street varies between two and four travel lanes as shown on Figure 1. In the southbound direction, there is approximately 870 feet of queuing capacity and in the northbound direction there is approximately 1,900 queuing capacity between the BNSF tracks and the signalized intersection at Lincoln Avenue. It is anticipated that in 2035 Madison Street will be a four-lane roadway for its entire limits.¹



Figure 1 – Madison St Queuing Capacity

Indiana Ave at Madison St is a signalized intersection and does not have Advance Railroad Preemption to the BNSF Railroad Crossing. BNSF has two active rail lines at the Madison St crossing which can concurrently serve freight, Metrolink and Amtrak trains.

Vehicular Arrival Rates

Tables 7 and 8 show existing and 2035 peak hour traffic volumes and arrival rates for the morning (7-9 am) and evening (4-6 pm) commute hours. The existing and 2035 peak hour traffic volumes were provided by Iteris' *Cristal View Terrace/Green Orchard Place/Overlook Parkway Project* Traffic Impact Analysis Study, Figures 4-4A, 4-6A, 5-2A, 5-5A, 6-5A, 6-6A, 6-7A, and 6-8A.

Table 7: Existing Peak Hour Volumes & Arrival Rates at Madison St at BNSF RR Xing

Scenario	Existing Peak Hour Volumes				Existing Arrival Rates (Vehicles per Minute)			
	Northbound		Southbound		Northbound		Southbound	
	AM	PM	AM	PM	AM	PM	AM	PM

¹ Consistent with the assumptions made in the EIR, , and to provide a worst-case scenario depiction of traffic impacts, 2035 conditions assume full build-out of all land uses (and their associated traffic generation), as well as full build-out of the transportation system. (Draft EIR p. 3.11-65.) Full build-out assumes maximum density of all land use designations under the General Plan. This Project, being a roadway project, does not generate any traffic, but it does redistribute it across the roadway network.

1	369	314	449	655	6.15	5.23	7.48	10.92
2	438	322	334	621	7.30	5.37	5.57	10.35
3	450	334	325	623	7.50	5.57	5.42	10.38
4	733	558	443	864	12.22	9.30	7.38	14.40

Table 8: 2035 Peak Hour Volumes & Arrival Rates at Madison St at BNSF RR Xing

Scenario	2035 Peak Hour Volumes				2035 Arrival Rates (Vehicles per Minute)			
	Northbound		Southbound		Northbound		Southbound	
	AM	PM	AM	PM	AM	PM	AM	PM
1	772	670	640	1280	12.87	11.17	10.67	21.33
2	901	716	490	1314	15.02	11.93	8.17	21.90
3	911	799	519	1326	15.18	13.32	8.65	22.10
4	1286	1073	946	1591	21.43	17.88	15.77	26.52

Queue Analysis

For the purpose of this study queue lengths calculations use average vehicle arrival rates, average gate down times, maximum train lengths, and 20 feet of queuing distance per vehicle. Table 9 reflects the existing and 2035 projected storage capacity on Madison Street between Indiana Ave and Lincoln Ave.

Table 9 – Madison St Queuing Capacity between Indiana Ave and Lincoln Ave

Year	Queuing Capacity (feet)	
	Southbound	Northbound
2011	870	1,900
2035	*1,200	*3,800

*Madison St will be a 4-lane roadway in the 2035 conditions

Tables 10-17 show existing and 2035 forecasted vehicle queues (feet/vehicles) on Madison Street at the BNSF Railroad crossing for the four scenarios. The queue figures are highlighted and the queues that exceed roadway capacity are shown in red text.

Table 10 – Scenario 1 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	6.15				12.87			
NB Queue (ft)/(veh)	260/13	100/5	360/18	520/26	640/32	220/11	840/42	1280/64
SB Arrival Rate (v/m)	7.48				10.67			
SB Queue (ft)/(veh)	320/16	120/6	420/21	620/31	540/27	180/9	700/35	1060/53

Table 11 – Scenario 1 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight +	Freight+Freight	Freight	Metrolink	Freight +	Freight+Freight

			Metrolink				Metrolink	
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	5.23				11.17			
NB Queue (ft)/(veh)	220/11	80/4	300/15	440/22	560/28	180/9	740/37	1120/56
SB Arrival Rate (v/m)	10.92				21.33			
SB Queue (ft)/(veh)	460/23	160/8	620/31	900/45	1060/53	340/17	1400/70	2120/106

Table 12 – Scenario 2 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	7.30				15.02			
NB Queue (ft)/(veh)	300/15	120/6	420/21	600/30	760/38	240/12	980/49	1500/75
SB Arrival Rate (v/m)	5.57				8.17			
SB Queue (ft)/(veh)	240/12	100/5	320/16	460/23	420/21	140/7	540/27	820/41

Table 13 – Scenario 2 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	5.37				11.93			
NB Queue (ft)/(veh)	220/11	80/4	300/15	440/22	600/30	200/10	780/39	1180/59
SB Arrival Rate (v/m)	10.35				21.90			
SB Queue (ft)/(veh)	440/22	160/8	580/28	860/43	1100/55	360/18	1440/72	2180/109

Table 14 – Scenario 3 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	7.50				15.18			
NB Queue (ft)/(veh)	320/16	120/6	420/21	620/31	760/38	240/12	1000/50	1520/76
SB Arrival Rate (v/m)	5.42				8.65			
SB Queue (ft)/(veh)	240/12	80/4	320/16	460/23	440/22	140/7	580/29	860/43

Table 15 – Scenario 3 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	5.57				13.32			
NB Queue (ft)/(veh)	240/12	100/5	320/16	460/23	660/33	220/11	880/44	1320/66
SB Arrival Rate (v/m)	10.38				22.10			
SB Queue (ft)/(veh)	440/21	160/8	580/28	860/43	1100/55	360/18	1440/72	2200/110

Table 16 – Scenario 4 AM Peak Hour Queue Lengths

Item	Existing				2035			
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	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	12.22				21.43			
NB Queue (ft)/(veh)	500/25	180/9	680/34	1020/51	1060/53	340/17	1400/70	2120/106
SB Arrival Rate (v/m)	7.38				15.77			
SB Queue (ft)/(veh)	320/16	120/6	420/21	620/31	780/39	260/13	1040/52	1560/78

Table 17 – Scenario 4 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	9.30				17.88			
NB Queue (ft)/(veh)	380/19	140/7	520/26	780/39	900/45	280/14	1180/59	1780/89
SB Arrival Rate (v/m)	14.40				26.52			
SB Queue (ft)/(veh)	600/30	220/11	800/40	1180/59	1320/66	420/21	1740/87	2640/132

Conclusion

Scenario 4 which removes the gates at Crystal View Terrace and Green Orchard Place and constructs Street “C” to connect the intersection of Overlook Parkway at Washington Street to the intersection of Victoria Avenue at Madison Street would generate the longest queues and delay at the Madison Street at BNSF crossing in both existing and 2035 conditions. Scenario 4 would allow motorists the options of using Street “C” or Washington Street to travel to and from SR-91, Indiana Avenue, and the Overlook Parkway area and thus Scenario 4 would increase traffic volumes and delay through the Madison Street at the BNSF crossing.

Tables 16 and 17 (Scenario 4) show that northbound queues are accommodated under existing and 2035 conditions. In the southbound direction, the following would exceed queuing capacity:

- Existing PM Freight + Freight – Queue exceeds capacity by 310 ft (16 vehicles). Although, per Table 6 there are only 5 freight trains that pass through the crossing between 3-7 pm. The likelihood that 2 opposing freight trains arrive concurrently at the crossing is low.
- 2035 AM Freight + Freight – Queue exceeds capacity by 360 ft (18 vehicles)
- 2035 PM Freight – Queue exceeds capacity by 120 ft (6 vehicles)
- 2035 PM Freight + Metrolink – Queue exceeds capacity by 540 ft (27 vehicles). All scenarios show that freight + Metrolink exceed queuing capacity in the 2035 PM peak hour.
- 2035 PM Freight + Freight – Queue exceeds capacity by 1440 ft (72 vehicles). All scenarios show that freight + freight exceed queuing capacity in the 2035 PM peak hour.

In general Madison St between Indiana Ave and Lincoln Ave can accommodate existing queues under all four scenarios. However, under Scenarios 1 and 4 southbound queues of 2 to 16 vehicles, respectively, spill onto Indiana Ave or Madison St, north of Indiana Ave, during the PM peak hour if multiple freight trains arrive. This spill over will only occur if multiple trains arrive concurrently and during the PM peak, and similar train-related delays will occur with or without the Project. For these reasons, this is not considered a significant impact.

By 2035 train volumes are expected to double in both the morning and evening peak hours. There is sufficient queuing capacity in the northbound direction in all four scenarios. For all scenarios in the

southbound direction, the PM peak hour could cause short-term, intermittent delay and spill over onto adjacent streets when multiple trains arrive (freight + freight or freight + Metrolink). In addition, in Scenario 4 single freight train arrivals in the PM Peak hour could cause short-term, intermittent delay and spill over onto adjacent streets. Due to the trains schedules, train headways, and number of trains the likelihood of opposing trains arriving concurrently at the Madison Street BNSF rail crossing is low. Nonetheless, if this occurs, southbound motorists can wait on Indiana Avenue and/or Madison Street north of Indiana Avenue. Based on the queuing analysis, the low probability of multiple trains arriving concurrently at the Madison Street BNSF crossing, the additional storage on Indiana Ave and Madison St north of Indiana Ave, similar delays would occur at buildout regardless of the Project, and the intermittent nature of such delays, the queuing impacts from all scenarios, including Scenario 4, are not anticipated to be significant.

III. Washington Street Queue Analysis

Washington Street is a north-south street which runs between Magnolia Ave Avenue and Diana Avenue and between Indiana Avenue and the southerly City limits into Riverside County. It has one travel lane in each direction between Magnolia Avenue and Diana Avenue, and one to two travel lanes in each direction between Indiana Avenue and the southerly City limits. Washington Street at the BNSF Crossing is a two lane roadway and is approximately 165 feet to the southerly limit line at Indiana Avenue, see Figure 2. In the southbound direction, there is approximately 165 feet of queuing capacity and in the northbound direction there is approximately 2,200 feet of queuing capacity between the BNSF tracks and the all-way stop intersection at Lincoln Avenue. Per the Master Plan of Roadways, attached Figure CCM-4, by 2035 Washington Street will remain a two lane roadway between Indiana Avenue and Victoria Avenue and widen to four lanes between Victoria Avenue and the southerly City limits.²

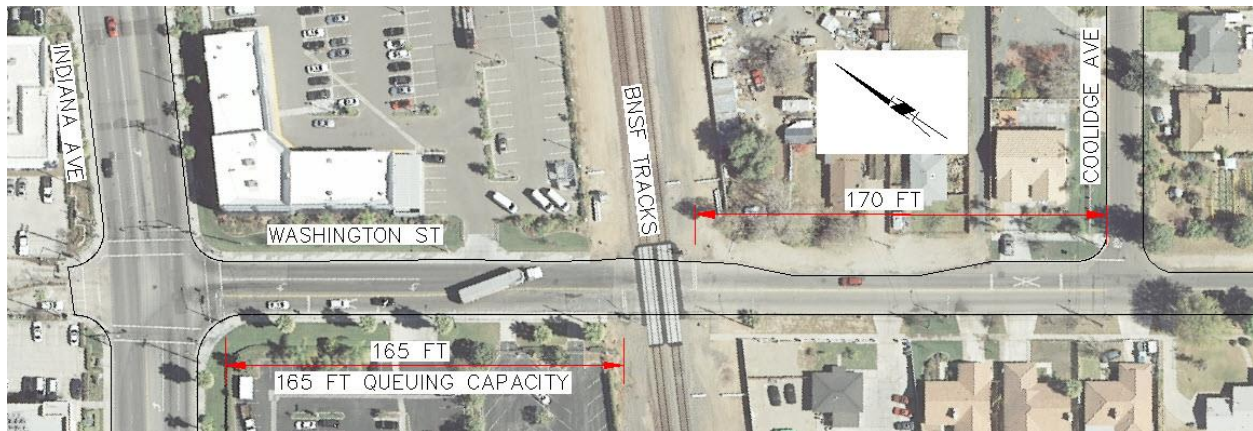


Figure 2 – Washington St Queuing Capacity

Indiana Ave at Washington Street is a signalized intersection and does not have Advance Railroad Preemption to the BNSF Railroad Crossing. BNSF has two active rail lines at the Washington Street crossing which can concurrently serve freight, Metrolink and Amtrak trains.

² Consistent with the assumptions made in the EIR, and to provide a worst-case scenario depiction of traffic impacts, 2035 conditions assume full build-out of all land uses (and their associated traffic generation), as well as full build-out of the transportation system. (Draft EIR p. 3.11-65.) Full build-out assumes maximum density of all land use designations under the General Plan. This Project, being a roadway project, does not generate any traffic, but it does redistribute it across the roadway network.

Arrival Rates

Tables 18 and 19 shows existing and projected 2035 peak hour traffic volumes and arrival rates for the morning (7-9 am) and evening (4-6 pm) commute hours. The existing and 2035 peak hour traffic volumes were taken from Iteris' *Cristal View Terrace/Green Orchard Place/Overlook Parkway Project* TIA, Figures 4-4A, 4-6A, 5-2A, 5-5A, 6-5A, 6-6A, 6-7A, and 6-8A.

Table 18: Existing Peak Hour Volumes & Arrival Rates at Washington St at BNSF RR Xing

Scenario	Existing Peak Hour Volumes				Existing Arrival Rates (Vehicles per Minute)			
	Northbound		Southbound		Northbound		Southbound	
	AM	PM	AM	PM	AM	PM	AM	PM
1	545	284	168	319	9.08	4.73	2.80	5.32
2	561	276	161	349	9.35	4.60	2.68	5.82
3	572	286	168	358	9.53	4.76	2.80	5.97
4	530	225	135	309	8.83	3.75	2.25	5.15

Table 19: 2035 Peak Hour Volumes & Arrival Rates at Washington St at BNSF RR Xing

Scenario	2035 Peak Hour Volumes				2035 Arrival Rates (Vehicles per Minute)			
	Northbound		Southbound		Northbound		Southbound	
	AM	PM	AM	PM	AM	PM	AM	PM
1	817	485	351	542	13.62	8.08	5.85	9.03
2	829	512	351	665	13.82	8.53	5.85	11.08
3	889	562	392	715	14.82	9.37	6.53	11.92
4	801	492	284	592	13.35	8.20	4.73	9.87

Queue Analysis

For the purpose of this study queue lengths calculations use average vehicle arrival rates, average gate down times, maximum train lengths, and 20 feet of queuing distance per vehicle. There are no planned improvements on Washington Street between Indiana Avenue and Lincoln Avenue and thus Table 20 reflects similar queuing capacity in existing and 2035 conditions.

Table 20 – Washington Street Queuing Capacity between Indiana Ave and Lincoln Ave

Year	Queuing Capacity (feet)	
	Southbound	Northbound
2011 & 2035	165	2,200

Tables 21-28 show existing and projected 2035 vehicle queues (feet/vehicles) on Washington Street at the BNSF Railroad crossing for the four scenarios. The queue figures are highlighted and the queues that exceed roadway capacity are shown in red text.

Table 21 – Scenario 1 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	9.08				13.62			
NB Queue (ft)/(veh)	380/19	140/7	520/26	760/38	680/34	220/11	900/45	1360/68
SB Arrival Rate (v/m)	2.80				5.85			
SB Queue (ft)/(veh)	120/6	60/3	160/8	240/12	300/15	100/5	400/20	580/29

Table 22 – Scenario 1 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	4.73				8.08			
NB Queue (ft)/(veh)	200/10	80/4	280/14	400/20	400/20	140/7	540/27	800/40
SB Arrival Rate (v/m)	5.32				9.03			
SB Queue (ft)/(veh)	220/11	80/4	300/15	440/22	460/23	160/8	600/30	900/45

Table 23 – Scenario 2 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	9.35				13.82			
NB Queue (ft)/(veh)	400/20	140/7	520/26	780/39	700/35	220/11	900/45	1380/69
SB Arrival Rate (v/m)	2.68				5.85			
SB Queue (ft)/(veh)	120/6	40/2	160/8	220/11	300/15	100/5	400/20	580/29

Table 24 – Scenario 2 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	4.60				8.53			
NB Queue (ft)/(veh)	200/10	80/4	260/13	380/19	440/22	140/7	560/28	860/43
SB Arrival Rate (v/m)	5.82				11.08			
SB Queue (ft)/(veh)	240/12	100/5	340/17	480/24	560/28	180/9	740/37	1100/55

Table 25 – Scenario 3 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	9.53				14.82			
NB Queue (ft)/(veh)	400/20	140/7	540/27	780/39	740/37	240/12	980/49	1480/74
SB Arrival Rate (v/m)	2.80				6.53			
SB Queue (ft)/(veh)	120/6	40/2	160/8	240/12	340/17	120/6	440/22	660/33

Table 26 – Scenario 3 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	4.76				9.37			
NB Queue (ft)/(veh)	200/10	80/4	280/14	400/20	480/24	160/8	620/31	940/47
SB Arrival Rate (v/m)	5.97				11.92			
SB Queue (ft)/(veh)	260/13	100/5	340/17	500/25	600/30	200/10	780/39	1180/59

Table 27 – Scenario 4 AM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	8.83				13.35			
NB Queue (ft)/(veh)	380/19	140/7	500/25	740/37	660/33	220/11	880/44	1340/67
SB Arrival Rate (v/m)	2.25				4.73			
SB Queue (ft)/(veh)	100/5	40/2	140/7	200/10	240/12	80/4	320/16	480/24

Table 28 – Scenario 4 PM Peak Hour Queue Lengths

Item	Existing				2035			
	Freight	Metrolink	Freight + Metrolink	Freight+Freight	Freight	Metrolink	Freight + Metrolink	Freight+Freight
Gate Time (s)	37.70	37.70	75.40	75.40	37.70	37.70	75.40	75.40
Track Occupied (s)	85.18	6.20	91.38	170.36	110.73	9.29	120.02	221.46
NB Arrival Rate (v/m)	3.75				8.20			
NB Queue (ft)/(veh)	160/8	60/3	220/11	320/16	420/21	140/7	540/27	820/41
SB Arrival Rate (v/m)	5.15				9.87			
SB Queue (ft)/(veh)	240/12	80/4	300/15	440/22	500/25	160/8	660/33	980/49

Conclusion

Scenario 3 which would remove the gates at Crystal View Terrace and Green Orchard Place and construct a connection on Overlook Parkway between Via Vista Drive and Sandtrack Road over the Alessandro Arroyo would generate longer queues and delay at the Washington Street at BNSF crossing in 2035 conditions. The existing queues for the four scenarios vary just slightly (0-3 vehicles) and are considered less than significant. Scenario 3 would allow motorists east of Sandtrack Road to travel to and from Indiana Avenue via Overlook Parkway and Washington Street and thus Scenario 3 would generate an increase in traffic volume and delay through the Washington Street at the BNSF crossing.

Tables 25 and 26 (Scenario 3) show that northbound queues are accommodated under existing and 2035 conditions. In the southbound direction, under Scenario 3, the following conditions could result in spill back onto the westbound dedicated left-turn and two-way left-turn lane and/or the #2 eastbound thru lane:

- Existing AM Freight + Freight – Queue exceeds capacity by 75 ft (4 vehicles). Although, per Table 1 there are only 7 freight trains that pass through the crossing between 6-9 a.m., or between 2-3 freight trains during the peak hour. The likelihood that both or two of the three freight trains arriving concurrently at the grade crossing is low. If multiple freight trains arrived concurrently and during the AM peak, the delay to traffic would be short-term and intermittent. Additionally, similar delays would occur regardless of the Project.

- Existing PM Freight, Freight + Metrolink, Freight + Freight – The queues exceed capacity by 95 ft, 175 ft, and 335 ft respectively. Under existing conditions, storage capacity is exceeded when a freight train arrives during the evening peak hour. The difference in the spillback amongst the scenarios is at most 40 ft (2 vehicles), not a significant figure. Also, Per Table 1 there are only 5 freight and 8 Metrolink trains that pass through the crossing between 3-7 p.m., or between 1-2 freight and 2 Metrolink trains during the P.M. peak hour. The likelihood of concurrent freight train arrivals is low although occasionally motorists would experience concurrent freight and Metrolink arrivals. This combination would exceed capacity by 135 ft (7 vehicles) at the most. If multiple trains arrived concurrently and during the PM peak, the delay to traffic would be short term and intermittent. Additionally, similar delays occur regardless of the Project
- 2035 PM Freight, Metrolink, Freight + Metrolink, Freight + Freight – The queues exceed capacity by 435 ft, 35 ft, 615 ft, and 1015 ft respectively. It should be noted that in 2035 all four scenarios exceed PM queue capacity for freight and concurrent train arrivals. In addition, Scenarios 2 and 3 also exceed queue capacity for Metrolink train arrivals. Per Table 2, there would be 12 freight, 13 Metrolink, and 1 Amtrak train arrivals during 3-7 pm. On average, there would be 3 freight, 3-4 Metrolink, and possibly 1 Amtrak train arrivals during the PM peak hour. Whether it is single or multiple train arrivals the queues would exceed capacity and spill onto Indiana Avenue. In the Indiana Ave westbound direction, queued motorists would be able to stack in the dedicated left-turn and two-way left turn pocket. Similar delays would occur under General Plan build-out conditions regardless of the Project

The four scenarios have varying impacts on the queues at Washington Street at the BNSF at-grade crossing, with Scenario 3 having the greatest impact at the Washington St BNSF rail crossing. Based on Tables 21-28 the northbound queues under all scenarios would be accommodated for existing and 2035 conditions. In the southbound direction, some conditions would exceed queuing capacity in existing and 2035 conditions. By 2035 the train arrivals are expected to double in the morning and evening peak hours and traffic volumes would increase especially in Scenarios 2 and 3. However, because the delays caused by queuing are intermittent and short-term in nature, and exist regardless of the Project under both current and buildout conditions, and because the likelihood of multiple trains arriving concurrently is variable and low, queuing impacts are considered less than significant.